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Report #2

MONTHLY PROGRESS REPORT

Development of Explosives and Initiators for Special Operations (U)

by

Theodore B. Johnson

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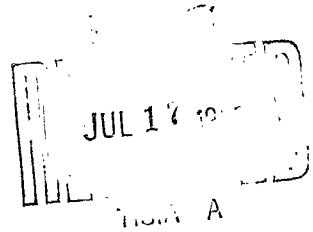

Remington Arms Company, Inc.
Bridgeport, Conn.

for

Picatinny Arsenal
Dover, New Jersey

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DEVELOPMENT OF EXPLOSIVES AND INITIATORS FOR SPECIAL WARFARE OPERATIONS

Initiating Explosives

Initiator development has been directed toward determining the range of conditions over which a satisfactory initiator can be made from litharge and picric acid.

1. The optimum ratio of picric acid to litharge,
2. optimum mixing procedure,
3. drying time and
4. minimum quantity sufficient to detonate picric acid have been established.

Best results were obtained by stirring the ingredients together wet in the proportions, by volume, of one part picric acid to one part litharge and 1½ parts water. Although this appears to be optimum, satisfactory results were obtained

a. by blending dry and then wetting the mixture and
b. from a ratio of one part of picric acid to two parts of litharge, indicating that there may be considerable latitude in the methods of preparation.

Satisfactory drying was obtained by spreading the wet paste on paper and air drying at room temperature overnight, or longer if the atmosphere was humid. Relative efficiencies of the products obtained by different blending procedures and ingredient ratios were determined by the fragmentation and sound resulting from their detonation in a fired 7.62mm cartridge case. Initiation for these tests was by an electric squib held in place against the sample by a plug of beeswax in the case mouth.

The apparent best initiator samples then were tested for their ability to detonate picric acid. In this test the cartridge case detonator, as described above, was embedded in 50 grams of picric acid packed loosely in a 3½ inch length of 1½ inch pipe capped at one end. This was placed, cap down, on a 6 inch square of lead, 1/8 inch thick, which in turn was placed on a 12 inch length of 4 inch pipe. Pictures of the fragments obtained in two tests are shown in Fig. I and Fig. II, along with pictures of the lead plate and the pipe containing the explosive. The initiator of Fig. I was 2 g. of a one to one mixture of picric acid and litharge blended wet with 1½ parts of water, while the initiator of Fig. II was 2½ g. of a dry blend of one part picric acid and one part litharge which was subsequently wet down and dried. In each case the detonation was violent and the small fragments of pipe were recovered only by careful search of the explosion pit.

With this encouraging beginning, work will be started to determine the conditions for satisfactory detonation of ammonium nitrate with this detonator-booster system. These will include the degree of confinement necessary and the quantity of picric acid, if any, that is needed. The development of a satisfactory improvised fuse also is necessary and initial work will be aimed at making a fuse from string and modifications of the picric acid-litharge mixtures.

High Explosives

Development of satisfactory improvised high explosives has centered around attempts to nitrate readily available materials, using common and relatively easy to handle acids. Considering the conditions under which nitration might have to be done in the field, this approach has met with limited success. Reaction of corn starch, sugar, ethylene glycol base anti-freeze or sawdust with battery acid and ammonium nitrate resulted in oxidation rather than nitration. A highly explosive liquid glycol nitrate was obtained from "Zerex" anti-freeze and

a. 95% nitric acid or
b. a mixture of ammonium nitrate and battery acid boiled to 2/3 its original volume, the former with ice and the latter with cold tap water cooling.

Reaction of starch, sugar and sawdust with these stronger acids cannot be kept from fuming off without extremely careful control of temperature and this does not appear to be practical for most conceivable applications. For the present, we plan to verify the range of conditions for the safe nitration of glycol type anti-freeze and then turn to combinations of fuels with highly oxidizing materials, such as the modern bleach powders. A list of oxidizer-fuel type high explosives that can be made comparatively easily from accessible chemicals is being drawn up.

Man Hours Expended in May

	Exempt	Non-exempt
Research and Engineering	100	-
Shop and Testing	10	14
Total	110	14

FIG. I

FIG. II

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